इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 2981 (1964): Layout Plan for Dairy Laboratories [FAD 19: Dairy Products and Equipment]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

IS : 2981 - 1964
(Reaffirmed 2003)
2009

Indian Standard

LAYOUT PLAN FOR DAIRY LABORATORIES

(First Reprint AUGUST 1989)

UDC 637·131 : 727·5 : 72·011

© *Copyright* 1965

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 9 *April* 1965

Indian Standard

LAYOUT PLAN FOR DAIRY LABORATORIES

Dairy Industry Sectional Committee, AFDC 12

Chairman	*Representing*
Dr. K. C. Sen	Indian Dairy Science Association, Bangalore
Members	
Agricultural Marketing Adviser to the Government of India	Directorate of Marketing & Inspection (Ministry of Food & Agriculture), Nagpur
Shri R. K. Malik (*Alternate*)	
Shri B. R. Bedekar	Hindustan Milkfood Manufacturers Limited, Nabha
Shri I. C. E. Dabson (*Alternate*)	
Shri C. V. Chandra Sekhar	T.T. (Private) Limited, Bangalore
Shri S. S. Mani (*Alternate*)	
Shri H. M. Dalaya	Kaira District Co-operative Milk Producers' Union Ltd., Anand
Dr. J. D. Contractor (*Alternate*)	
Shri C. D. Dastoor	Larsen & Toubro Ltd., Bombay
Shri H. W. Ramchandani (*Alternate*)	
Director	Directorate of Military Farms, Army Headquarters
Assistant Director, Military Farms (Planning) (*Alternate*)	
Executive Health Officer	Municipal Corporation, Bombay
Municipal Analyst (*Alternate*)	
Col A. G. Fernandes	Food Inspection Organization, Quartermaster General's Branch, Army Headquarters
Lt-Col N. G. C. Iengar (*Alternate*)	
Shri G. W. Fuller	Nestle's Products (India) Ltd., New Delhi
Shri F. J. Ryan (*Alternate*)	
Dr. K. K. Iya	National Dairy Research Institute, Karnal
Dr. N. N. Dastur (*Alternate*)	
Shri A. R. A. Krishnan	Defence Production Organization [Ministry of Defence (CGDP)]
Shri K. P. Singh (*Alternate*)	
Col M. N. Kunzru	Technical Standardization Committee (Foodstuffs) (Ministry of Food & Agriculture)
Dr. S. S. Phatak (*Alternate*)	
Shri A. K. Majumdar	Dairy Development Commissioner, Government of Maharashtra
Shri Y. V. Salpekar (*Alternate*)	

(*Continued on page* 2)

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

(*Continued from page* 1)

Members	*Representing*
MILK COMMISSIONER	Milk Commissioner, Madras
SHRI W. V. MITCHELL	Hindustan Lever Ltd., Bombay
DR. A. P. MAHADEVAN (*Alternate*)	
SHRI S. N. MITRA	Central Food Laboratory, Calcutta
SHRI B. K. MURTHY	Indian Aluminium Co. Ltd., Calcutta
SHRI N. GOPAL KRISHNAN (*Alternate*)	
SHRI J. PADMANABHAN	The A.P.V. Engineering Co. Ltd., Calcutta
SHRI J. G. BROWN (*Alternate*)	
SHRI S. RAMASWAMY	Directorate General of Technical Development
SHRI V. H. SHAH	Vulcan Trading Co. (Private) Ltd., Bombay
SHRI A. JENSEN (*Alternate*)	
DR. R. S. SRIVASTAVA	Central Committee for Food Standards (Ministry of Health)
SHRI P. JANARDANA AIYAR (*Alternate*)	
DR. M. SWAMINATHAN	Central Food Technological Research Institute (CSIR), Mysore
SHRI M. R. CHANDRASEKHARA (*Alternate*)	
SHRI R. H. VARIAVA	Polson Limited, Bombay
SHRI B. P. PALKHIWALLA (*Alternate*)	
SHRI H. C. VERMA	Ministry of Food & Agriculture
SHRI S. N. MOHAN (*Alternate*)	
DR. I. S. VERMA	Dairy Technology Division, National Dairy Research Institute, Karnal
SHRI M. R. SRINIVASAN (*Alternate*)	
SHRI JAMES N. WARNER	In personal capacity (*Allahabad Agricultural Institute, Allahabad*)
DR. D. V. KARMARKAR, Deputy Director (Agri & Food)	Director, ISI (*Ex-officio Member*)

Secretaries

SHRI P. H. RAMANATHAN
Assistant Director (Agri & Food), ISI

SHRI P. V. SANE
Extra Assistant Director (Agri & Food), ISI

Methods of Test for Dairy Products Subcommittee, AFDC 12 : 4

Convener	
DR. N. N. DASTUR	National Dairy Research Institute, Karnal

Members	
DAIRY DEVELOPMENT ADVISER TO THE GOVERNMENT OF INDIA	Ministry of Food & Agriculture
SHRI S. N. MOHAN (*Alternate*)	
DIRECTOR	Directorate of Military Farms, Army Headquarters
DR. A. T. DUDANI	National Dairy Research Institute, Karnal
COL A. G. FERNANDES	Food Inspection Organization, Quartermaster General's Branch, Army Headquarters
LT-COL N. G. C. IENGAR (*Alternate*)	

(*Continued on page* 48)

CONTENTS

PAGE

0. FOREWORD 4

1. SCOPE 5

2. CATEGORIES OF DAIRY LABORATORIES 5

3. TESTS 5

4. LOCATION 5

5. LAYOUT 6

6. GENERAL REQUIREMENTS 16

7. SPECIAL REQUIREMENTS 25

8. APPARATUS AND EQUIPMENT 25

9. CHEMICALS AND CONSUMABLE STORES 25

Indian Standard
LAYOUT PLAN FOR DAIRY LABORATORIES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 3 October 1964, after the draft finalized by the Dairy Industry Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 The need for a standard layout for the various dairy laboratories required for quality control of milk and milk products has been keenly felt by all those responsible for planning and organizing dairies. Requests for the preparation of such a layout plan had come from various organizations. The Sectional Committee responsible for this standard recognized the fact that such a readily available plan for dairy laboratories would expedite the execution of various dairy projects.

0.3 Five types of laboratories have been envisaged in this standard depending upon the quantity of milk handled by each dairy (*see* **2**). The tests that could be ordinarily carried out in each type of these laboratories have been listed (*see* Table 1). Details of construction regarding flooring, ventilation, dimensions for cupboards and benches, etc, have also been given (*see* **6**). It was also felt that it would be useful to give a list of apparatus, equipment and chemicals required for the different types of laboratories to help the various organizations in starting work in the laboratories.

0.4 This standard is in the nature of recommendations giving all the essentials normally required for a dairy laboratory but modifications could be made to suit individual cases, if necessary. These recommendations may be useful for some of the milk collecting and processing centres.

0.5 Considerable assistance has been derived from the National Dairy Research Institute, Karnal, in the preparation of the standard and appreciative acknowledgement is made for this help. Reference has also been made to B.S. 3202 : 1959 ' Recommendations on laboratory furniture and fittings '.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the layout plans for dairy laboratories primarily for routine testing of milk and milk products.

2. CATEGORIES OF DAIRY LABORATORIES

2.1 For the purpose of this standard, dairy laboratories have been classed into five categories, namely, A, B, C, D and E depending on the volume of milk handled by the dairy.

2.1.1 *Category A* — Laboratory for dairies handling one lakh litres of milk per day or more.

2.1.2 *Category B* — Laboratory for dairies handling 25 000 litres of milk per day or more, but less than one lakh litres.

2.1.3 *Category C* — Laboratory for dairies handling 10 000 litres of milk per day or more, but less than 25 000 litres.

2.1.4 *Category D* — Laboratory for dairies handling 5 000 litres of milk per day or more, but less than 10 000 litres.

2.1.5 *Category E* — Laboratory for dairies handling less than 5 000 litres of milk per day.

3. TESTS

3.1 The different tests that may ordinarily be required to be carried out in the various categories of dairy laboratories at different stages of handling of milk are indicated in Table 1.

4. LOCATION

4.1 The dairy laboratory should be so located in the dairy premises that it is easily accessible to all the major activities of the dairy. It shall be so located as to avoid vibrations of all kinds and should preferably be away from boiler houses.

---

*Rules for rounding off numerical values (*revised*).

5. LAYOUT

5.1 The laboratories in different categories should have adequate number of rooms, suitable dimensions are given in Table 2. While setting up a laboratory, the possible expansion of the dairy should be kept in view. Typical layout plans for each category of laboratories have been given in Fig. 1A to 1J.

5.2 Every laboratory should be provided with a minimum of two exits.

TABLE 1 TESTS TO BE ORDINARILY CARRIED OUT IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES AT DIFFERENT STAGES OF HANDLING OF MILK

(*Clause* 3.1)

NOTE — The sign (+) means that the test should ordinarily be carried out and the sign (—) means that the test may or may not be carried out.

PARTICULARS OF TEST	CATEGORIES OF DAIRY LABORATORIES			REF TO CL NO. OF IS : 1479/OTHER STANDARDS
	A, B, C	D	E	
(1)	(2)	(3)	(4)	(5)
		Raw Milk		
1. Organoleptic	+	+	+	4 (Part I)*
2. Sediment	+	+	+	6 (Part I)*
3. Density	+	+	+	5 (Part I)*
4. Acidity *or* Alcohol Test *or* Clot on Boiling (COB)	+	+	+	14 (Part I)* 9 (Part I)* 8 (Part I)*
5. Fat Percent	+	+	+	15 (Part I)*
6. Solids-not-fat (SNF)	+	+	+	16 (Part I)*
7. Freezing Point	+	+	+	(Part IV)†
8. Microscopic Count *or* Resazurin Test *or* MBR Test	+	+	—	13 *or* 11 *or* 12 (Part I)*
9. Temperature	+	+	+	—
10. Common Preservatives	+	+	+	18 (Part I)*
11. Common Adulterants	+	+	+	17 (Part I)*
12. Neutralizers	+	+	+	19 (Part I)*

*Methods of test for dairy industry : Part I Rapid examination of milk [IS : 1479 (Part I)-1960].

†Methods of test for dairy industry : Part IV Freezing point depression of milk by Hortvet method [IS : 1479 (Part IV) 1962].

(*Continued*)

TABLE 1 TESTS TO BE ORDINARILY CARRIED OUT IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES AT DIFFERENT STAGES OF HANDLING OF MILK — *Contd*

PARTICULARS OF TEST	CATEGORIES OF DAIRY LABORATORIES			REF TO CL NO. OF IS : 1479/OTHER STANDARDS
	A, B, C	D	E	
(1)	(2)	(3)	(4)	(5)
		Chilled Raw Milk from Storage Tank		
1. Temperature	+	+	−	4 (Part I)*
2. Acidity	+	−	−	14 (Part I)*
3. Fat Percent	+	−	−	15 (Part I)*
4. SNF	+	−	−	16 (Part I)*
5. Freezing Point	+	+	+	(Part IV)†
6. MBR *or* Resazurin	+	+	−	3 (Part III)‡ 4 (Part III)‡
		Pasteurized Milk (Bulk or Bottled)		
1. Density	+	+	+	5 (Part I)*
2. Acidity	+	+	+	14 (Part I)*
3. Fat Percent	+	+	+	15 (Part I)*
4. SNF	+	+	+	16 (Part I)*
5. Standard Plate Count (SPC)	+	+	−	5 (Part III)‡
6. Coliform Test	+	+	+	8 (Part III)‡
7. MBR *or* Resazurin	+	+	+	3 *or* 4 (Part III)‡
8. Phosphatase Test	+	+	+	26 (Part II)§
9. Freezing Point	+	+	+	(Part IV)†
10. Checking Holding Time for HTST Pasteurizers	+	+	+	3 (Part V)‖
		Skimmed Milk Powder Used in Toned Milk		
1. Limit for Scorched Particles	+	+	−	*See* IS : 1165-1957¶
2. Flavour	+	+	−	
3. Solubility Index	+	+	−	
4. Titratable Acidity	+	+	−	
5. Moisture Percent	+	+	−	
6. Fat Percent	+	+	−	
7. Standard Plate Count	+	+	−	
8. Coliform Test	+	+	−	

*Methods of test for dairy industry : Part I Rapid examination of milk [IS : 1479 (Part I)-1960].

†Methods of test for dairy industry : Part IV Freezing point depression of milk by Hortvet method [IS : 1479 (Part IV)-1962].

‡Methods of test for dairy industry : Part III Bacteriological analysis of milk [IS : 1479 (Part III)-1962].

§Methods of test for dairy industry : Part II Chemical analysis of milk [IS : 1479 (Part II)-1961].

‖Methods of test for dairy industry : Part V Methods of dairy plant control [IS : 1479 (Part V)-1962].

¶Specification for milk powder (whole & skim).

(*Continued*)

TABLE 1 TESTS TO BE ORDINARILY CARRIED OUT IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES AT DIFFERENT STAGES OF HANDLING OF MILK — *Contd*

PARTICULARS OF TEST	CATEGORIES OF DAIRY LABORATORIES			REF TO CL NO. OF IS : 1479/OTHER STANDARDS
	A, B, C	D	E	
(1)	(2)	(3)	(4)	(5)
	Water Supply			
1. Hardness	+	+	—	*See* IS : 1620-1961*
2. Chlorine Content	+	+	—	”
3. Coliform Test	+	+	—	*See* IS : 1622-1964†
4. Plate Count	+	+	—	—
5. CO_2	+	+	—	*See* IS : 1620-1961*
6. *p*H	+	+	—	*See* IS : 1631-1960‡
	Toned Milk			
1. Same as Pasteurized Milk	+	+	—	
Returned Milk from the Distribution Centres or Excess of Milk Stored in Storage Tanks after Bottling				
1. Organoleptic	+	+	—	4 (Part I)§
2. Acidity	+	+	—	14 (Part I)§
	Sterilized Milk			
1. Colour	+	—	—	—
2. Flavour	+	—	—	—
3. Turbidity Test	+	—	—	27 (Part II)‖
4. Fat Percent	+	—	—	15 (Part I)§
5. Total Solids	+	—	—	4 (Part II)‖
6. Standard Plate Count	+	—	—	5 (Part III)¶
7. Storage Trial by Incubation for 3 days at 37°C ± 0·5°C	+	—	—	—
8. B. Coli	+	—	—	8 (Part III)¶
	Cream			
1. Fat Percent	+	+	+	*See* IS : 1224 - 1958**
2. Acidity	+	+	+	—

*Methods of test (chemical) for industrial water.

†Methods of test for microbiological examination of industrial water.

‡Methods of test (physical) for industrial water.

§Methods of test for dairy industry : Part I Rapid examination of milk [IS : 1479 (Part I)-1960].

‖Methods of test for dairy industry : Part II Chemical analysis of milk [IS : 1479 (Part II)-1961].

¶Methods of test for dairy industry : Part III Bacteriological analysis of milk [IS : 1479 (Part III)-1962].

**Determination of fat in whole milk, evaporated (unsweetened) milk, separated milk, skim milk, buttermilk and cream by the Gerber method.

(*Continued*)

TABLE 1 TESTS TO BE ORDINARILY CARRIED OUT IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES AT DIFFERENT STAGES OF HANDLING OF MILK — *Contd*

PARTICULARS OF TEST	CATEGORIES OF DAIRY LABORATORIES			REF TO CL NO. OF IS : 1479/OTHER STANDARDS
	A, B, C	D	E	
(1)	(2)	(3)	(4)	(5)
		Skimmed Milk		
1. Fat Percent	+	+	+	*See* IS : 1224-1958*
2. Total Solids Percent	+	+	+	4 (Part II)†
		Butter		
1. Moisture Percent	+	+	+	—
2. Fat Percent	+	+	+	—
3. Salt Percent	+	+	+	—
4. Curd Percent	+	+	+	—
		Ghee		
1. BR Index (40°C)	+	+	—	—
2. Reichert Value	+	+	—	—
3. Polenske Value	+	+	—	—
4. Acid Value	+	+	—	—
		Casein		
1. Colour	+	+	—	—
2. Moisture Percent	+	+	—	*See* IS : 1167-1957‡
3. Fat Percent	+	+	—	,,
4. Acidity	+	+	—	—
		Dahi		
1. Fat Percent	+	—	—	—
2. Acidity Percent	+	—	—	—
3. Total Solids Percent	+	—	—	—
		Ice-Cream		
1. Fat Percent	+	—	—	*See* IS : 2802-1964§
2. Total Solids Percent	+	—	—	
3. Sugar Percent	+	—	—	
4. Weight per Litre	+	—	—	

*Determination of fat in whole milk, evaporated (unsweetened) milk, separated milk, skim milk, buttermilk and cream by the Gerber method.

†Methods of test for dairy industry: Part II Chemical analysis of milk [IS : 1479 (Part II) - 1961].

‡Specification for edible casein.

§Specification for ice-cream.

(*Continued*)

TABLE 1 TESTS TO BE ORDINARILY CARRIED OUT IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES AT DIFFERENT STAGES OF HANDLING OF MILK — *Contd*

PARTICULARS OF TEST	CATEGORIES OF DAIRY LABORATORIES			REF TO CL NO. OF IS : 1479/OTHER STANDARDS
	A, B, C	D	E	
(1)	(2)	(3)	(4)	(5)
	Cheese			
1. Moisture Percent	+	–	–	*See* IS : 2785-1964*
2. Fat Percent	+	–	–	
3. Total Solids Percent	+	–	–	
4. Salt Percent	+	–	–	
5. Acidity Percent	+	–	–	
	Milk Cans, Bottles, Pipelines and Fittings, Tanks			
1. Standard Plate Count	+	+	–	—
2. Coliform Test	+	+	–	—
	Milk Bottles			
1. Volume	+	+	+	*See* IS : 1392-1959†
2. Shape	+	+	+	,,
3. Dimensions	+	+	+	,,
4. Design	+	+	+	,,
5. Impact Test	+	–	–	,,
6. Thermal Shock	+	+	+	,,
7. Machine Trial	+	+	+	—
	Detergent Solution			
1. Strength of the Solution	+	+	+	8(Part V)‡
2. *p*H	+	+	+	7(Part V)‡
	Sanitizers			
1. Available Chlorine	+	+	+	10(Part V)‡

*Specification for hard cheese, processed cheese and processed cheese spread.

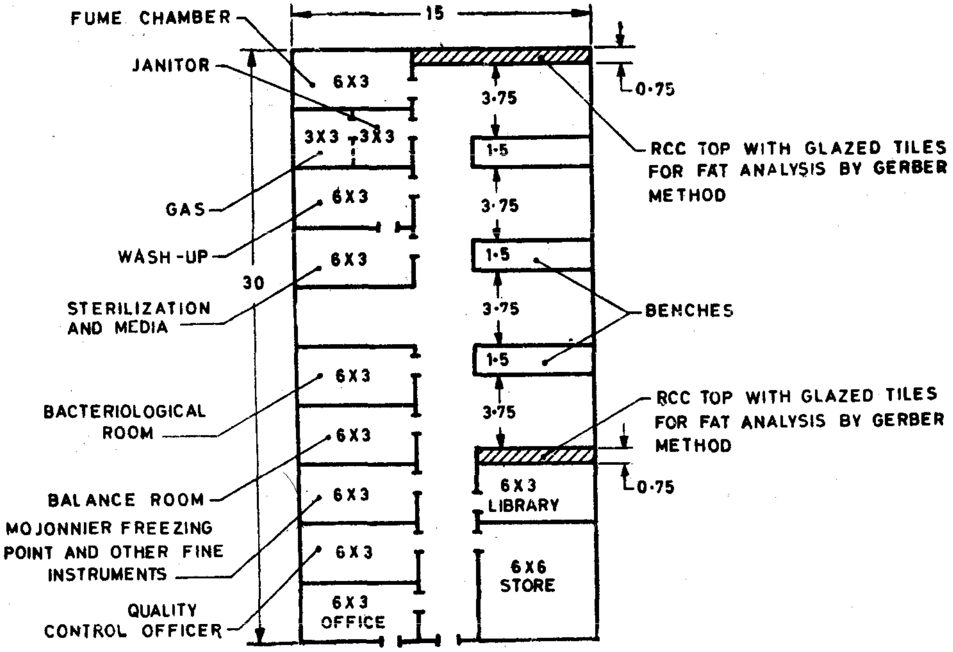
†Specification for glass milk bottles.

‡Methods of test for dairy industry : Part V Methods of dairy plant control [IS : 1479 (Part V)-1962].

TABLE 2 FLOOR AREAS OF ROOMS FOR DIFFERENT CATEGORIES OF DAIRY LABORATORIES

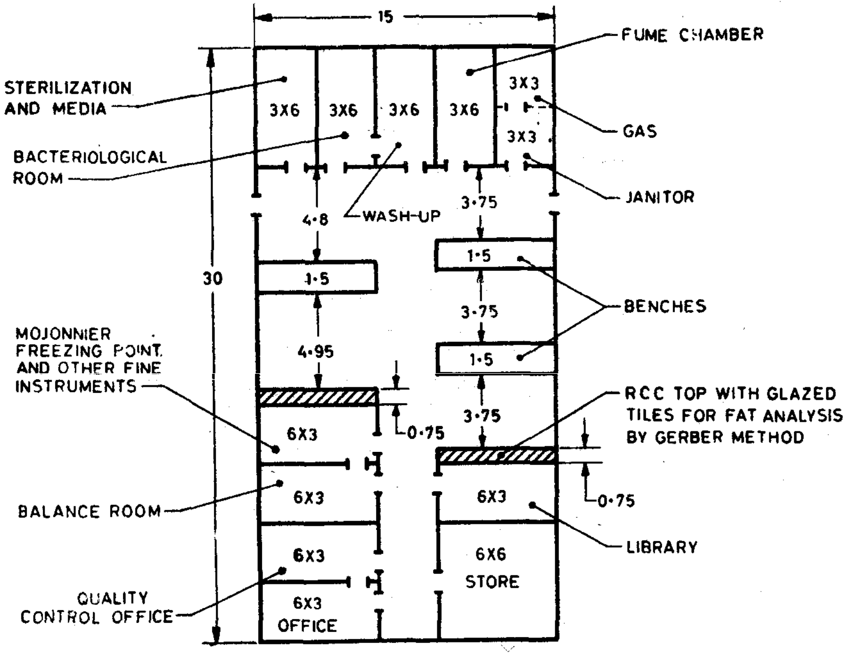
(*Clause* 5.1)

Particulars of Room	Area in Square Metres Category of Dairy Laboratory					
	A	B	C		D	E
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Office	18	9	9	7·5	9	9
2. Quality Control Officer's Room	18	9	9	6	9	—
3. Fine Instruments	18	—	—	—	—	—
4. Balance	18	18	9	13·5	—	—
5. Bacteriological	18	18	9	13·5	—	—
6. Wash-up	18	18	18	13·5	9	9
7. Sterilization and Media	18	18	9	7·5	—	—
8. Gas	9	9	9	6	—	—
9. Janitor	9	9	—	—	—	—
10. Fume Chamber	18	—	—	—	—	—
11. Store	36	18	9	13·5	9	—
12. Library	18	—	—	—	—	—
13. Analytical Hall	234	144	108	108	72	36
14. Total Floor Area	450	270	189	189	108	54
Reference to Figure	1A & 1B	1C & 1D	1E	1F	1G & 1H	1J



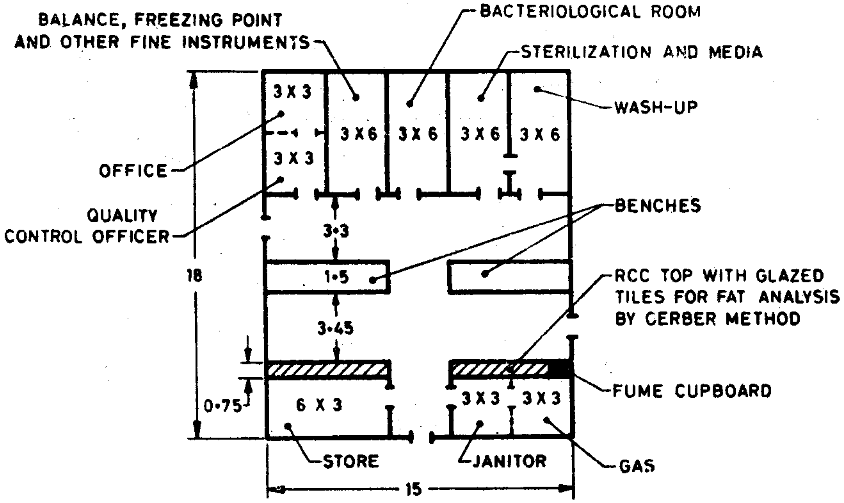
All dimensions in metres.

FIG. 1A A TYPICAL PLAN FOR LABORATORIES OF CATEGORY A



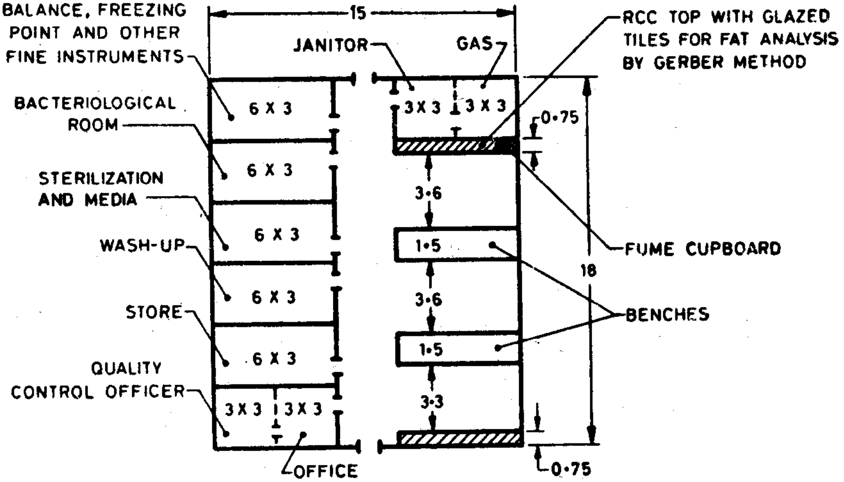
All dimensions in metres.

FIG. 1B A TYPICAL PLAN FOR LABORATORIES OF CATEGORY A



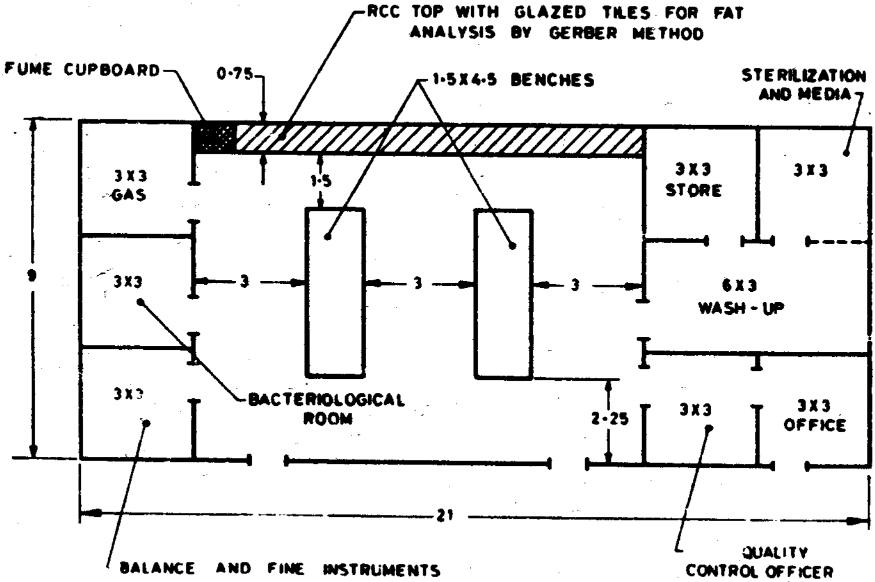
All dimensions in metres.

Fig. 1C A Typical Plan for Laboratories of Category B



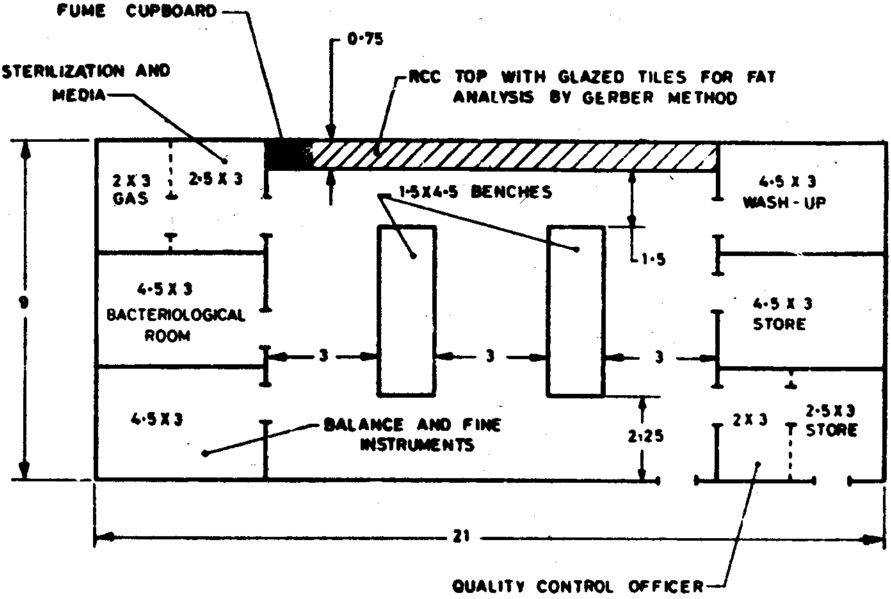
All dimensions in metres.

Fig. 1D A Typical Plan for Laboratories of Category B



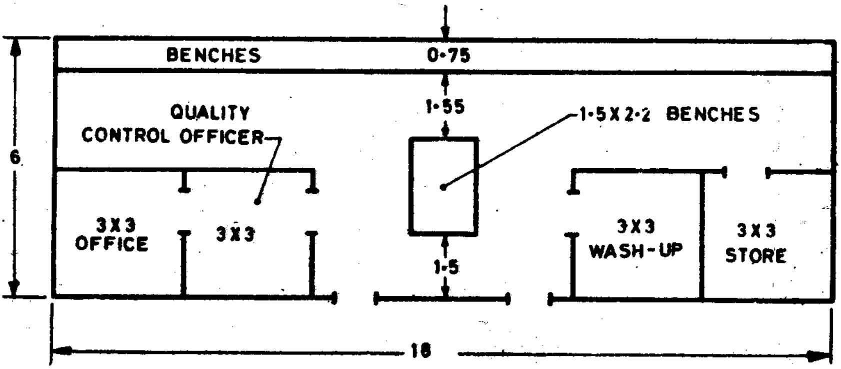
All dimensions in metres.

Fig. 1E A Typical Plan for Laboratories of Category C



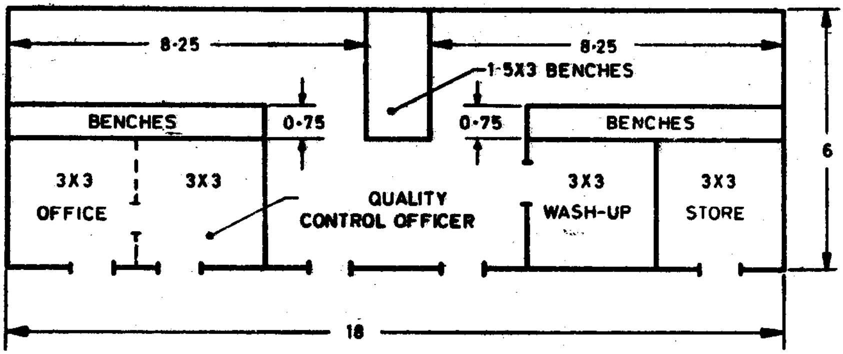
All dimensions in metres.

Fig. 1F A Typical Plan for Laboratories of Category C



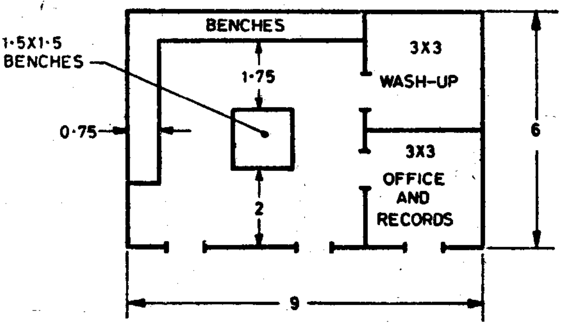
All dimensions in metres.

FIG. 1G A TYPICAL PLAN FOR LABORATORIES OF CATEGORY D



All dimensions in metres.

FIG. 1H A TYPICAL PLAN FOR LABORATORIES OF CATEGORY D



All dimensions in metres.

FIG. 1J A TYPICAL PLAN FOR LABORATORIES OF CATEGORY E

6. GENERAL REQUIREMENTS

6.1 Walls — The walls of the laboratory should be smoothly finished. They may be tiled with glazed tiles conforming to IS : 777-1961* in the wash-up room and on the platform where the Gerber test is conducted.

6.2 Windows — Sufficient number of windows fitted with glass panes to receive adequate natural light should be provided. To facilitate easy access, the windows should be at a height over 100 cm from the floor and the benches should be at the same or a lesser height.

6.3 Lighting — Direct sunlight should be avoided for benches intended for sensitive instruments, for example, chemical balances. Lights should be provided to give a minimum average intensity of 400 to 450 lumen/m^2 at working level. For store room, corridor, etc, the intensity may be considerably lower. Special operations may require special lighting.

6.4 Flooring — The laboratory floor should be non-slippery, capable of being easily cleaned and non-absorbent. Any type of *in-situ* cement concrete or tiled floor is considered satisfactory.

6.5 Store-Room — The store should consist of two rooms, one for keeping acids, ammonia, other alkalies, etc, and the other for keeping fine chemicals, apparatus and equipment.

6.6 Benches

6.6.1 There are several designs of benches that could be used in the laboratory. Some of the designs found convenient with dimensions 150 × 75 × 90 cm, 220 × 75 × 90 cm, 360 × 67·5 × 90 cm, 150 × 75 × 90 cm and 210 × 75 × 75 cm have been shown in Fig. 2, 3, 4, 5 and 6, respectively.

6.6.2 The benches should be made out of seasoned hardwood, like teak and sheesham. Teak may be used as a solid top or in the form of block-board faced with teak on both the sides.

6.6.3 The unit type of interchangeable laboratory furniture based on certain modular dimensions offers a number of advantages. It offers versatility in the assembly of single width wall benches or single and double width island and peninsular benches in lengths based on multiples of a unit size. A range of unit underbench components of fixed or mobile form designed to meet the basic but diverse needs of laboratory work gives such a system great flexibility and once the general layout has been decided, it is only necessary to select the type of underbench components.

6.6.4 *Above Bench Fittings* — The above bench components include shelving of various kinds. Shelving in long and short runs or in the form of wall or bench cases may be open fronted or closed. When closed with doors, these should preferably be glazed, with or without frames and sliding rather than hinged. Shelving should not be wider than essential to its purpose and should be restricted so that only single line capacity is available when used for carrying chemical reagent bottles, glassware or items needing care in handling.

---

*Specification for glazed earthernware tiles.

6.6.5 *Underbench Fittings* — The underbench components include the drawer and cupboard with shelf accommodation. The underbench unit could be of fixed or removable type and interchangeable. Benches intended to be used for chemical work should have adequate storage facilities and benches shown in Fig. 2, 3, 4 and 6 may be convenient. For bacteriological work leg space is necessary under the bench top and the bench shown in Fig. 5 may be convenient.

6.6.6 *Bench Top* — The thickness of the bench top should be 3 cm and should be covered with a suitable material resistant to acid and alkali. For tops of benches intended to be used for chemical work, it is preferable to cover them with removable and easily cleanable asbestos sheet which also serves as a safeguard against fire. For bacteriological work materials with smooth surfaces like heat resistant plastics or linoleum may be found convenient.

6.7 Cupboards

6.7.1 The laboratory should be provided with adequate number of cupboards not only to protect the apparatus but also to permit tidiness and cleanliness in the laboratory work.

6.7.2 *Wall Cupboards* — The advantage of having wall cupboards is that they provide space for storing some of the material without occupying the floor space. These could be fixed on the walls at a convenient height of, say, 135 cm. With this height it is possible to have a wall bench below the cupboard which could be used for routine work. The convenient dimensions for the wall cupboards are 150 × 90 × 30 cm. The doors of the cupboard should preferably be of sliding type rather than hinged. These could be used for keeping certain reagent and chemical bottles.

6.8 Sinks

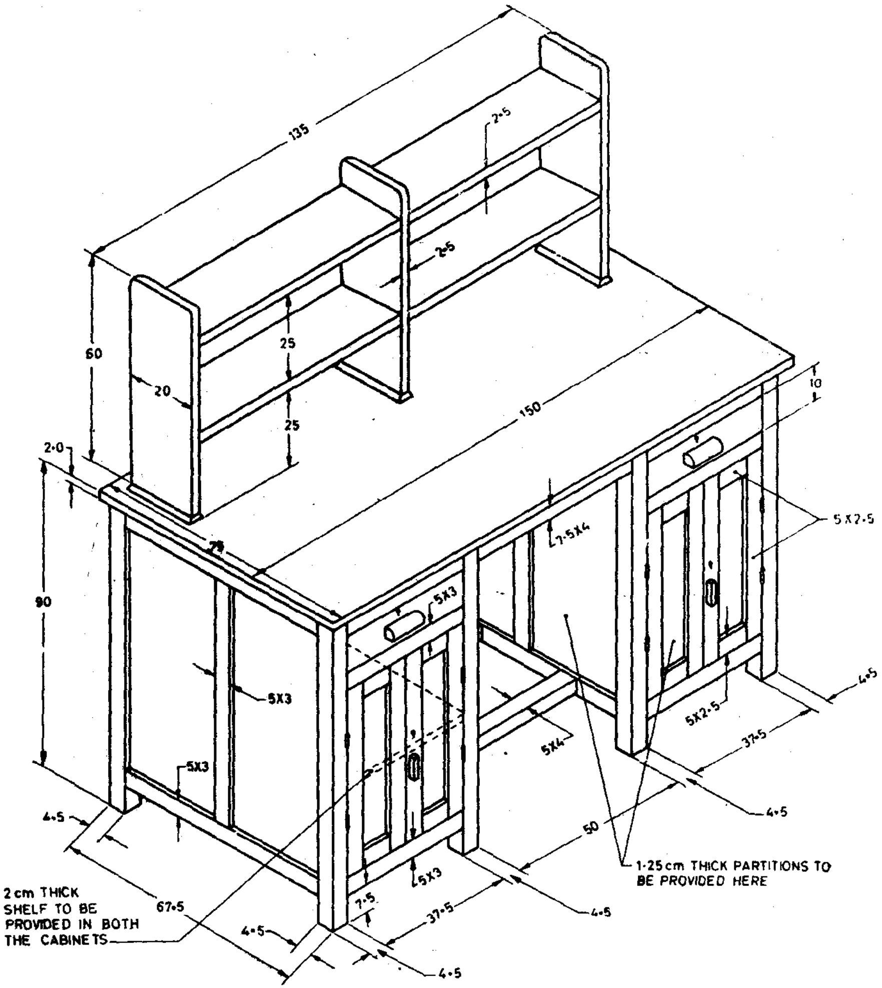
6.8.1 Sinks of suitable dimensions should be provided in wash-up rooms. They should be made of glazed earthenware (*see* IS : 771-1958*) or vitreous ware (*see* IS : 2556-1963†) or stainless steel and should be preferably of dimensions 75 × 45 × 25 cm. There shall be no over-hanging shelf or cupboard over the sink.

---

*Specification for white glazed earthenware sanitary appliances.

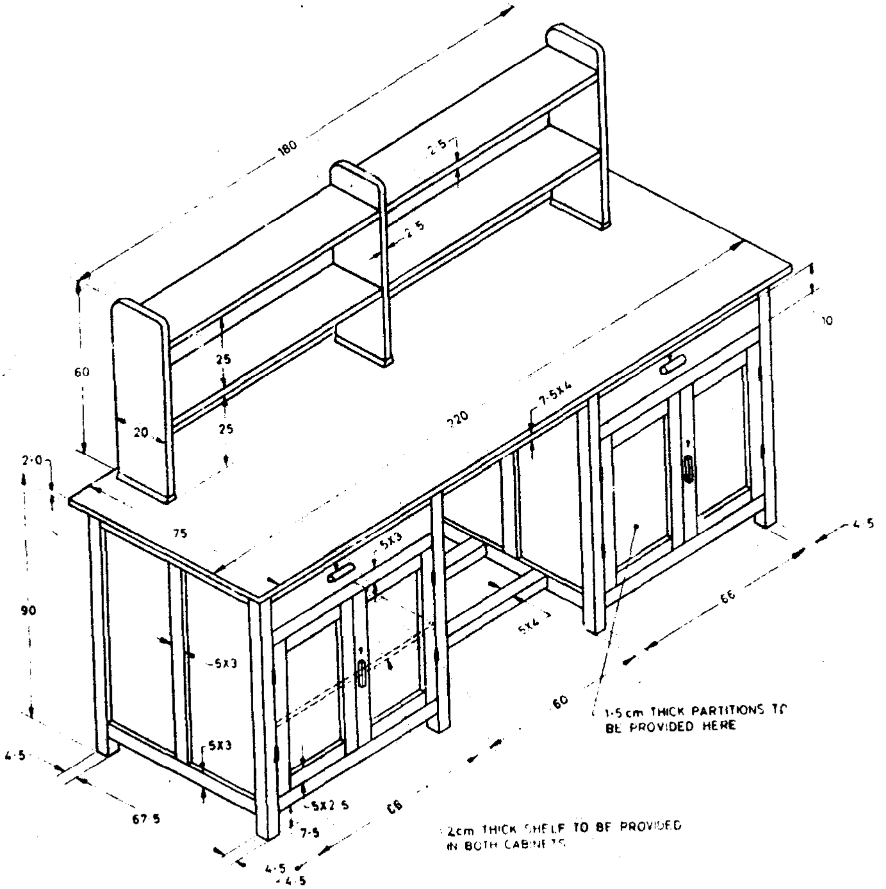
†Specification for vitreous sanitary appliances (vitreous china).

6.8.2 It is recommended that the sinks on the service bench should be fitted beneath the bench top, the hole being cut to reveal part of the rim and sealed with a non-hardening mastic or protected by a lead flushing. The sinks on the service bench may be made out of porcelain or other suitable material. The recommended dimensions for these sinks are 45 × 30 × 20 cm.


135
2·5
2·5
60
25
20
25
2·0
90
75
150
10
5X3
7·5X4
5X2·5
5X3
5X3
4·5
5X4
5X2·5
37·5
4·5
50
1·25 cm THICK PARTITIONS TO BE PROVIDED HERE
2 cm THICK SHELF TO BE PROVIDED IN BOTH THE CABINETS
67·5
4·5
7·5
5X3
37·5
4·5
4·5
4·5

All dimensions in centimetres.

Fig. 2 Details of Laboratory Bench, 150 × 75 × 90 cm

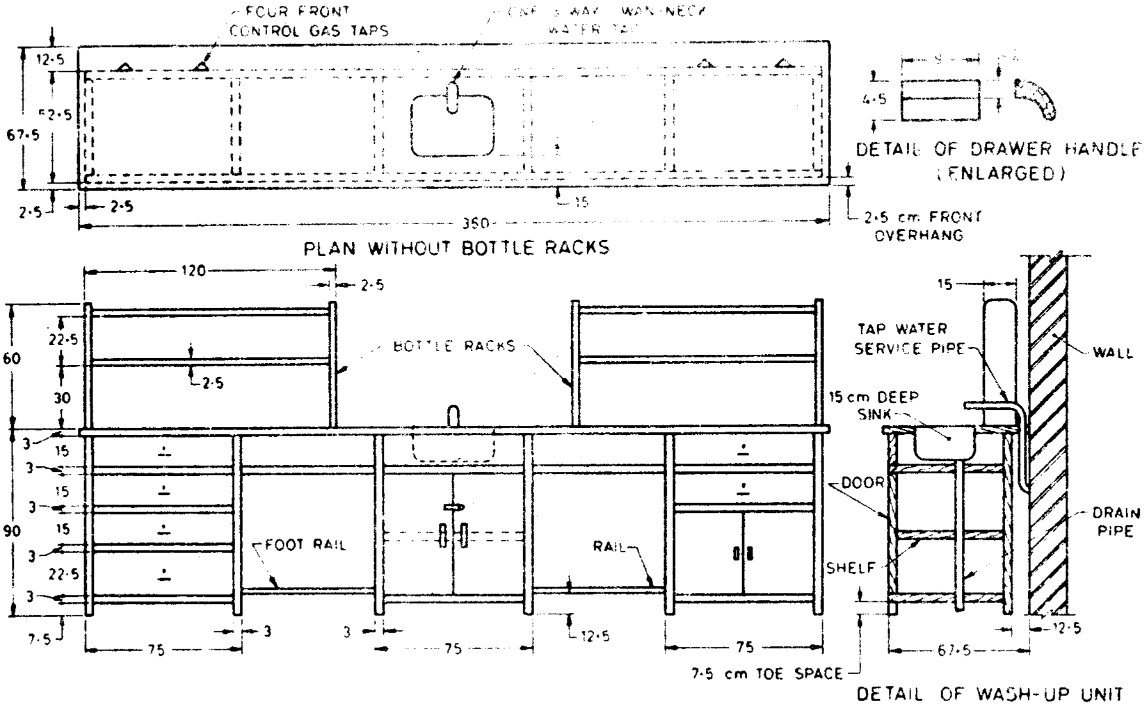

180
2·5
2·5
60
25
25
20
2·0
75
220
7·5X4
10
90
5X3
5X3
5X3
5X4·5
4·5
66
60
1·5 cm THICK PARTITIONS TO BE PROVIDED HERE
4·5
67·5
5X2·5
7·5
66
2cm THICK SHELF TO BE PROVIDED IN BOTH CABINETS
4·5
4·5

All dimensions in centimetres.

FIG. 3 DETAILS OF LABORATORY BENCH, 220 × 75 × 90 cm

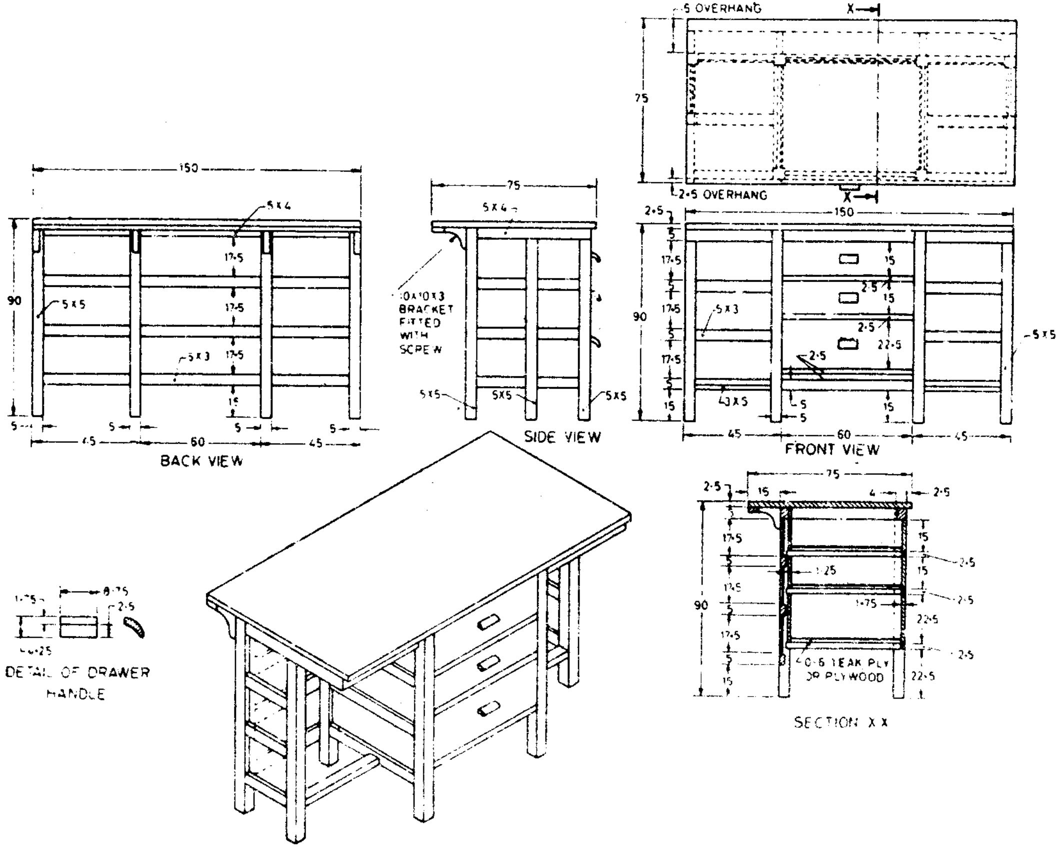
6.8.3 It is advantageous to have a sink at a distance of about one metre on either side of the laboratory bench.

6.8.4 In case of wash-up sinks the distance between the tap on the sink and the bottom of the sink should be more than 60 cm.



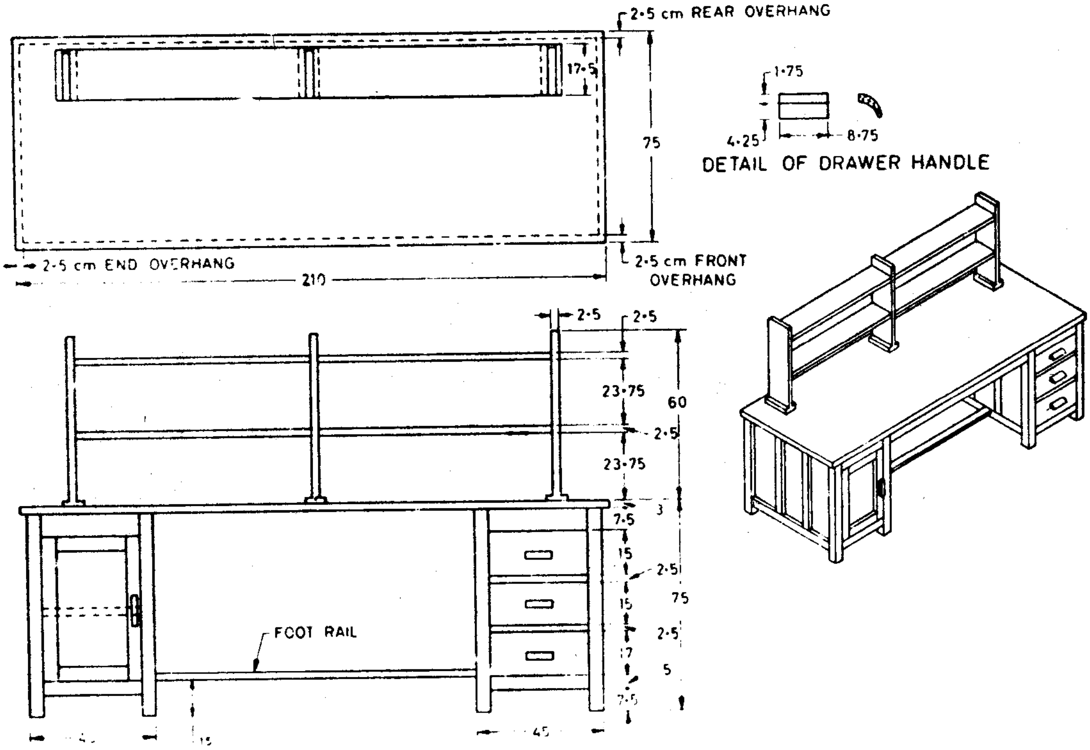
All dimensions in centimetres.

FIG. 4 DETAILS OF LABORATORY BENCH 360 × 67·5 × 90 cm



All dimensions in centimetres.

FIG. 5 DETAILS OF LABORATORY BENCH, 150 × 75 × 90 cm



All dimensions in centimetres.

FIG. 6 DETAILS OF LABORATORY BENCH, 210 × 75 × 75 cm

6.9 Fume Cupboard

6.9.1 The laboratories in Category A, B and C should be equipped with fume cupboard.

6.9.2 The fume cupboard should be equipped with services and provided with an efficient means of removing objectionable fumes, gases, vapours, etc. Two main types of exhaust methods are in general use, the positive system and the ejector system. In the positive system, the fumes are extracted by means of fan impellers placed inside the ducting, whereas in the case of ejector system, the fan is isolated from the fumes themselves but causes a current of air to be forced through a venturi, thus acting as a form of pitot tube and inducing a draught in the ducting. This in turn results in the fumes being drawn away from the fume cupboard. The positive system is considered to be the most efficient.

6.9.3 In locating the fume cupboards, the main consideration should be the convenience of the user. Fume cupboards are generally built against a wall. If so, the inside wall shall be faced with white glazed tiles or coated with a white acid-resistant paint. The fume cupboard floor may be made of hard asbestos or RCC slab faced with white glazed tiles. An adequate air flow through the fume cupboard shall be ensured. It is generally accepted that the draught of a fume cupboard should be such that 3 to 7 changes of air per minute are made possible. In dairy laboratories 4 to 5 changes of air per minute may be considered sufficient.

6.9.4 The recommended dimensions for fume cupboards to be used in dairy laboratories are given in Table 3.

TABLE 3 RECOMMENDED DIMENSIONS FOR FUME CUPBOARDS

SL No. (1)	PARTICULARS (2)	DIMENSIONS (3) cm
i)	Height of base (working surface from floor)	90
ii)	Clear width of front opening	90
iii)	Height of front opening	90
iv)	Height of top of cupboard from base (working surface)	105 to 180
v)	Depth of clear working space	60 to 90

6.9.5 *Services* — The main services required in fume cupboards are gas, water, waste outlet and electricity. All services should be plainly identified by the use of colours, distinctively shaped taps, labelling, etc (*see* IS : 2379-1963* and IS : 375-1963†). All mechanical services should have outside controls with the outlets arranged in the front corners of the base, in the front pilasters or along the sides of the fume cupboards. If, for any reason, it is not convenient to arrange the services in one or another of these positions they should be placed at the back of the fume cupboard, either on the base or in a row on the back vertical face. Electrical outlets should be arranged outside the fume cupboard and it is desirable that they be kept as far away as possible from the water service.

6.10 Water Supply — In the normal course, when dairies have adequate water supply, there should be no special problems of providing water to the laboratory as such. In case, however, separate arrangements for water have to be made for the laboratory, normal requirements should be met by an allowance of 9 litres per minute per point with an allowance of a 50 percent diversity factor, which means half the taps to be used in full spate at any given time, or all the taps at half spate, and so on.

6.11 Distilled Water — Each laboratory should be equipped with a distilled water plant of adequate capacity.

6.12 Gas — The laboratories in all the categories may have their own gas plant or portable gas supplies where available. While calculating the gas requirements, allowance may be made for a 50 percent diversity factor, that is, if there are 20 gas points in the laboratory, the gas plant should be sufficient to run 10 points at full capacity. One Bunsen burner consumes 0·15 cubic metre of gas per hour. For small laboratories, a gas plant with 3 cubic metres per hour capacity (20 burners) and for Category A, B and C laboratories, a gas plant with 5·5 cubic metres per hour capacity (40 burners) may be considered sufficient.

6.13 Service Lines — The service lines, namely, those of tap water, electric power and gas, should run along the walls, concealed, 80 cm above floor level and connections taken to the laboratory benches. Following points should be borne in mind while installing service lines:

a) Benches should be easily removable, and
b) Service lines should be easily accessible.

6.14 Drainage — An underground drainage system complying with the requirements given in IS : 1742-1960‡ should be provided. It should be covered with metal or cement slabs which are easily removable for easy cleaning and inspection. At the outlet end of the laboratory drain, a siphon-trap should be provided to prevent the entry of rodents.

---

*Colour code for the identification of pipeline.

†Marking and arrangement for switchgear, bus-bars, main connections and auxiliary wiring.

‡Code of practice for building drainage.

6.15 Each laboratory shall be equipped with fire extinguishers of suitable sizes (*see* IS : 2190-1962*) and first-aid box.

6.16 To ensure sufficient ventilation, an exhaust fan of suitable size should be provided in the laboratory (*see* IS : 2312-1963†).

6.17 Each laboratory, as far as possible, shall be air-conditioned.

7. SPECIAL REQUIREMENTS

7.1 Fat Test — A white tiled platform of suitable dimensions would be found to be advantageous for conducting fat test.

7.2 Wash-Up Room — In wash-up rooms, it is desirable to have 3 sink units with suitable draining board and draining rack.

7.3 Balance Room — The balance room should be so located in laboratory that it is least affected by vibrations.

7.4 Doors — The doors of the laboratory should be self closing.

7.5 Bacteriological Room — The bacteriological room should be dust-free and air-conditioned.

7.6 Drains — The drains should be made of stoneware. While constructing drains, the volume of discharge should be taken into account. The drains should be provided with suitable traps and should be made of an acid-proof material. Grease traps should be provided in the drains at suitable places.

7.7 All the rooms meant for analytical work in the laboratory should be fly-proof and rodent-proof.

8. APPARATUS AND EQUIPMENT

8.1 The apparatus and equipment required in different categories of dairy laboratories are given in Table 4.

9. CHEMICALS AND CONSUMABLE STORES

9.1 The chemicals and consumable stores required in different categories of dairy laboratories have been given in Table 5. Pure chemicals should be stored, unless mentioned otherwise.

---

*Code of practice for selection, installation and maintenance of portable first-aid fire appliances.

†Specification for propeller type ac ventilating fans.

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES

(*Clause* 8.1)

NOTE — The sign (+) means that the laboratory shall be equipped with that apparatus/equipment and the sign (—) means that the laboratory may not be equipped with that apparatus/equipment.

APPARATUS/EQUIPMENT	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Adaptors, glass, for condensers of diameter 25 mm	+	+	—
Aprons, rubber and cloth	+	+	+
Aspirator bottles, glass/polyethylene, with stopper and outlet near the bottom, capacity 5 to 10 litres	+	+	+
Autoclave, for steam sterilization, up to a maximum pressure of 2·1 kg/cm², complete with thermometer, pressure gauge, air cock, draw-off cock, adjustable safety valve, wire-mesh basket/perforated shelf, depth of boiler 43·5 cm, diameter of boiler 34·5 cm, electrically heated	+	+	+
Automatic measure for amyl alcohol to deliver 1-ml quantities, capacity 250 or 500 ml (*see* IS : 1223-1958*) with stand and drip tray	+	+	+
Automatic measure for sulphuric acid to deliver 10-ml quantities (*see* IS : 1223-1958*), capacity 1 litre, with stand and drip tray	+	+	+
Balance, analytical, capacity 200 g on each pan, sensitivity 1/10 mg, with case (preferably chainometric or single pan)	+	+	+
Balance, box scale, capacity 3 kg	+	+	+
Balance, physical, capacity 200 g on each pan, sensitivity 1 mg, with case	+	+	+
Balance, triple beam, capacity 1 100 g	+	+	—

*Specification for apparatus for the determination of fat in whole milk, evaporated (unsweetened) milk, separated milk, skim milk, buttermilk and cream by the Gerber method.

(*Continued*

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

Apparatus/Equipment	Category of Dairy Laboratory		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Barometer, aneroid, diameter of the dial approximately 30 cm	+	+	−
Basins, evaporating, glazed porcelain, with spout, dia 80 mm (capacity 75 ml)	+	+	+
Basins, evaporating, glazed porcelain, with spout, dia 90 mm (capacity 125 ml)	+	+	+
Basins, evaporating, silica, with spout, dia 100 mm	+	+	−
Basins, glass, crystallizing, dia 60 mm	+	+	−
Basins, glass, crystallizing, dia 80 mm	+	+	−
Basins, porcelain, glazed, with handle and spout, dia 80 mm	+	+	−
Beakers, heat-resistant glass, with spout, capacity:			
2 litres	+	+	+
1 litre	+	+	+
750 ml	+	+	+
500 ml	+	+	+
400 ml	+	−	−
250 ml	+	+	+
100 ml	+	+	+
50 ml	+	+	+
Blender, electric	+	−	−
Boss heads	+	+	+
Bottles, dilution (McCartney), with aluminium cap fitted with rubber liner, 170 ml, marked at 99-ml level	+	+	+
Bottles, dilution (McCartney), with aluminium cap fitted with rubber liner, 25 ml, marked at 9-ml level	+	+	+
Bottles, reagent, NM, with glass stopper, capacity:			
2 litres	+	+	−
1 litre	+	+	+
500 ml	+	+	+
250 ml	+	+	+
100 ml	+	+	+

(*Continued*)

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

APPARATUS/EQUIPMENT	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Bottles, reagent, WM, with glass stopper, capacity:			
500 ml	+	+	+
250 ml	+	+	+
100 ml	+	+	+
Bottles, sample, with suitable enclosure, glass/polyethylene, WM, capacity:			
250 ml	+	+	+
100 ml	+	+	+
50 ml	+	+	+
Burette, capacity 50 ml, sub-divided into 1/10 ml, with ground glass stopcock, at least 'B' Grade	+	+	+
Burette, micro, automatic (preferred), for graduating Gerber butyrometers, capacity 1 ml, with glass stop-cock, certified accuracy	+	+	—
Burette stand, wooden	+	+	+
Burners:			
Bunsen type	+	+	+
Fish tail	+	+	+
Ring, for use with gas	+	+	+
Butter moisture tester with cup, riders, and tong	+	+	—
Butyrorefractometer with thermometer and hot water circulating attachment	+	—	—
Butyrometers, Gerber:			
For milk, 0-8 percent fat (*see* IS : 1223-1958*)	+	+	+
For milk, 0-10 percent fat (*see* IS : 1223-1958*)	+	+	+
Certified, 0-8 percent fat	+	+	+
Certified, 0-10 percent fat	+	+	—
For skimmed milk, 0-1 percent fat (*see* IS : 1223-1958*)	+	+	+
For cream, 0-70 percent fat (*see* IS : 1223-1958*)	+	+	+

*Specification for apparatus for the determination of fat in whole milk, evaporated (unsweetened) milk, separated milk, skim milk, buttermilk and cream by the Gerber method.

(*Continued*)

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

Apparatus/Equipment	Category of Dairy Laboratory		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Callipers for internal and external measurement, 0-15 cm and 0-6 in, each with vernier	+	+	+
Centrifuge, electric, speed up to 3 000 rpm, capacity 200 ml, with adapters for 15-ml, 25-ml, and 50-ml glass tubes	+	—	—
Centrifuge, for the Gerber fat test, with speed indicator (*see* IS : 1223-1958*)	+	+	+
Centrifuge tubes, glass:			
15 ml	+	—	—
25 ml	+	—	—
50 ml	+	—	—
Trommsdorf, capacity of capillary portion 0·02 ml and 0·05 ml	+	—	—
Clamps for use with retort stands, assorted, to take tubes of 2·5, 5·0 and 6·5 mm diameters	+	+	+
Clips, screw type, size of the blade 30 mm	+	+	+
Colony counter, fitted with guide plate	+	+	—
Colorimeter, photo-electric, with fillers, fused glass cells, test-tubes, voltage stabilizer	+	—	—
Comparator, all-purpose, for taking *p*H discs, phosphatase test disc, resazurin test disc	+	+	+
Comparator disc:			
For *p*H, bromothymol blue (6·0-7·6)	+	+	—
For *p*H, bromo-cresol purple (5·2-6·8)	+	+	—
For *p*H, methyl red (4·4-6·0)	+	+	—
For phosphatase test (Aschaffenburg-Mullen)	+	+	+
For resazurin test	+	+	+

*Specification for apparatus for the determination of fat in whole milk; evaporated (unsweetened) milk, separated milk, skim milk, buttermilk and cream by the Gerber method.

(*Continued*)

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

APPARATUS/EQUIPMENT	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Condenser, glass, double-jacketed, length of jacket 30 cm	+	+	+
Cork borer set of 12 borers with handle, steel, nickel plated	+	+	+
Cork borer sharpner	+	+	+
Cork presser, wheel pattern	+	+	+
Cork rings, compressed, diameter 8 cm, 10 cm and 12 cm	+	–	–
Cork screw	+	+	+
Crucibles, Gooch, porcelain/sintered glass, capacity 30 ml	+	+	–
Cutting plier	+	+	+
Cylinders, measuring, glass, with spout, capacity:			
2 litres	+	+	–
1 litre	+	+	+
500 ml	+	+	+
250 ml	+	+	+
100 ml	+	+	+
50 ml	+	+	+
25 ml	+	+	+
10 ml	+	+	+
Cylinders, measuring, glass, with stopper, 100 ml	+	+	–
Cylinders, ungraduated, glass with/without spout, capacity:			
100 ml	+	+	+
200 ml	+	+	+
1 000 ml	+	+	+
Deep-freeze cabinet	+	–	–
Desiccator, glass, with ground-glass stop-cock on top, porcelain/metal, disc, internal diameter 25-30 cm	+	+	+

(*Continued*

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

Apparatus/Equipment	Category of Dairy Laboratory		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Diamond point pencil	+	+	+
Dishes with tight fitting lids, stainless steel/aluminium, diameter 75 mm, height 25 mm, flat bottom	+	+	+
Distil water still, glass, capacity of flask 2 litres	+	+	−
Distil water still, to give 2-4 litres/hour	+	+	+
Dropping bottles, capacity 50 ml	+	+	+
Drying device for slides	+	+	−
Durham tubes, rimless, heavy wall, nominal size length 30 mm, external diameter 6 mm	+	+	+
File, triangular, 10-15 cm	+	+	+
Filter pump, glass/metal	+	+	+
Filter stand, wooden, for taking 2 funnels	+	+	+
First-aid box with accessories	+	+	+
Flasks, Buchner, glass, capacity:			
250 ml	+	+	+
500 ml	+	+	−
1 000 ml	+	−	−
Flasks, conical, heat-resistant glass, capacity:			
2 litres	+	+	−
1 litre	+	+	+
500 ml	+	+	+
250 ml	+	+	+
100 ml	+	+	+
Flasks, extraction, 250 ml	+	+	+
Flasks, flat bottom, heat-resistant glass, capacity:			
1 litre	+	+	+
500 ml	+	+	+
300 ml	+	+	+
250 ml	+	+	+
100 ml	+	+	+

(*Continued*)

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

APPARATUS/EQUIPMENT	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Flasks, Kjeldahl, 800-1 000 ml	+	—	—
Flasks, measuring, stoppered, capacity:			
1 litre	+	+	+
500 ml	+	+	+
250 ml	+	+	+
100 ml	+	+	+
100-110 ml (Reichert value)	+	+	—
50 ml	+	+	—
Forceps, nickel plated, curved ends, 7·5 cm	+	+	+
Funnels, glass, of dia:			
25 cm	+	+	+
12 cm	+	+	+
6 cm	+	+	+
4 cm	+	+	+
Funnels, glass, separating, cylindrical, 500 ml	+	+	—
Funnels, hot water, copper, double jacketed, to take 15-cm funnel	+	+	—
Gas plant, to work on nephtha/petrol, capacity 40 (5·5 m³/h)/20 (3 m³/h) burners	+	+	—
Gas taps, 2-way and 4-way	+	+	—
Glass beads, 1-3 mm diameter	+	+	+
Glass cells, fused, in pairs, 25·0 mm and 13·5 mm	+	+	+
Glass rods, assorted, diameter 2 to 5 mm	+	+	+
Glass tubing, assorted, diameter 3 to 10 mm	+	+	+
Goggles, all round eye protection, shatterproof	+	+	+
Guide plates, 5·0 × 11·25 mm, with 16 or 24 round or square areas for use with microscopic slides	+	+	—
Hammer	+	+	+
Hand gloves, rubber	+	+	+

(Continued)

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

APPARATUS/EQUIPMENT	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Hand tally registering to 4 figures with zero reset control with push button for manual operation and a chain retaining ring	+	+	−
Hortvet cryoscope complete with thermometers, glass tubes, starter, blower, etc [*see* IS : 1479 (Part IV)-1962*]	+	+	+
Hot-plates, electric, 1 000 W/2 000 W	+	+	+
Hydrometer, density, for testing milk at 20°C, 1·025-1·035 (*see* IS : 1183-1957†)	+	+	+
Hydrometer, density, for testing milk at 20°C, 1·025-1·035, certified	+	+	+
Hydrometer, density, for testing milk at 20°C, 1·015-1·025 (*see* IS : 1183-1957†)	+	+	+
Hydrometer, density, for testing milk at 20°C, 1·015-1·025, certified	+	+	+
Hydrometer jars, glass/metal, 100 ml (*see* IS : 1183-1957†)	+	+	+
Hydrometer jars, glass/metal, 200 ml (*see* IS : 1183-1957†)	+	+	+
Hydrometer, specific gravity:			
Universal range 0·50-2·00	+	+	+
Range 0·60-0·80	+	+	+
,, 0·80-1·00	+	+	+
,, 1·60-1·80	+	+	+
,, 1·80-2·00	+	+	+
Impact testing machine for milk bottles	+	−	−
Incubator, anhydric, electric, thermostatically controlled, to work at 37° ± 0·5°C, with double doors, trays, and 0·50°C thermometer	+	+	−
Jars with cover and racks for keeping slides	+	+	−

*Methods of test for dairy industry : Part IV Freezing point depression of milk by Hortvet method.

†Specification for density hydrometers for use in milk.

(*Continued*)

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

Apparatus/Equipment	Category of Dairy Laboratory		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Kjeldahl distillation apparatus, capacity of the flask 1 000 ml, complete with condenser, splash head, stand and clamps	+	–	–
Lamp, spirit	+	+	+
Lock stoppers with pins, for Gerber fat test (*see* IS : 1223-1958*)	+	+	+
Magnifier (× 2·5), dia 10 cm	+	+	+
Maximum-minimum thermometer in °C, with magnet	+	+	–
Mercuryvapour lamp with Wood's filter	+	–	–
Metre scale	+	+	+
Microscope lamp	+	+	–
Microscope with × 10, × 40, × 100 objectives, condenser, mechanical stage, eye pieces (× 5, × 10, × 15), preferably with attached illuminator in wooden case	+	+	–
Milk sediment standards chart	+	+	+
Mohor clips, length 50 mm	+	+	+
Mojonnier fat extraction tubes	+	–	–
Needle, with bent point	+	+	–
Oven, electric, for drying and sterilizing, temperature up to 250°C, with thermometer, and two shelves, 60 × 45 × 60 cm	+	+	+
Oven, electric, thermostatically controlled, temperature up to 150° ± 1°C, with thermometer and one shelf, 30 × 30 × 30 cm	+	+	–
Oven, steam, copper, double walled, with 0-100°C thermometer and two shelves, 30 × 30 × 30 cm	+	+	+
Pails for waste, with cover	+	+	+

*Specification for apparatus for the determination of fat in whole milk, evaporated (unsweetened) milk, separated milk, skim milk, buttermilk and cream by the Gerber method.

(*Continued*)

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

APPARATUS/EQUIPMENT	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Pestle and mortar, porcelain, internal diameter 15 cm	+	+	–
Petri dish container, tinned brass, with cover to take 10 × 3 petri dishes of 100 mm diameter, 23 cm diameter	+	+	–
Petri dishes, outside diameter 98 mm, inside diameter 94 mm, depth 15 mm, with flat bottom [*see* IS : 1479 (Part III)-1962*]	+	+	+
*p*H meter, battery or mains operated with glass, quinhydrone and calomal electrodes	+	+	+
Pipette, Breed's, calibrated to deliver 0·01 ml (*see* IS : 2803-1964†)	+	+	+
Pipette, bulb, one-mark (*see* IS : 1117-1958‡):			
50 ml	+	+	+
25 ml	+	+	+
20 ml	+	+	+
Pipette, bulb, one-mark, 11 ml (to deliver 11·04 ml) (*see* IS : 1223-1958§)	+	+	+
Pipette, bulb, one-mark (*see* IS : 1117-1958‡):			
10 ml	+	+	+
5 ml	+	+	+
2 ml	+	+	+
1 ml	+	+	+
Pipette case, thick copper, cylindrical, with tight-fitting cover, 450 × 70 mm	+	+	+
Pipette, cylindrical, graduated (*see* IS : 1117-1958‡):			
25 ml	+	+	–
10 ml	+	+	+
5 ml	+	+	+
1 ml	+	+	+

*Methods of test for dairy industry : Part III Bacteriological analysis of milk.

†Specification for capillary pipette for direct microscopic count of milk.

‡Specification for one-mark pipettes.

§Specification for apparatus for the determination of fat in whole milk, evaporated (unsweetened) milk, separated milk, skim milk, buttermilk and cream by the Gerber method.

(*Continued*)

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

Apparatus/Equipment	Category of Dairy Laboratory		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Pipette, cylindrical, graduated, blow-out type, for bacteriological work (*see* IS : 2025-1962*):			
11 ml	+	+	+
10 ml	+	+	+
2·2 ml for delivering successive 0·1 ml, 0·1 ml, 1·0 ml and 1·0 ml milk	+	+	+
1·1 ml for delivering successive 0·1, 0·5 and 0·5 ml of milk	+	+	+
1·1 ml for delivering successive 0·1 and 1·0 ml of milk	+	+	+
Pipettes, one-mark, graduated to deliver 9 ml	+	+	+
Pipette stand, wooden	+	+	+
Platinum wire holder	+	+	–
Plungers for taking milk samples, stainless steel [IS : 1479 (Part I)-1960†]	+	+	+
Polariscope (0·19 to 0·28 m^2)	+	+	–
Refrigerator, electric	+	+	–
Reichert value distillation apparatus with 300-ml flask, condenser, splash head, 100 to 110-ml measuring flask, asbestos ring, stand and clamps	+	+	–
Retort stand rings, assorted sizes, 100-150 mm	+	+	+
Retort stands	+	+	+
Rose-Gottlieb fat extraction tubes with spare siphons [*see* IS : 1479 (Part II)-1961‡]	+	+	–
Rubber blow balls, with inlet and outlet valves, air reservoir and short length tubing connected to outlet	+	+	–

*Specification for cylindrical pipettes for bacteriological examination of milk.

†Methods of test for dairy industry : Part I Rapid examination of milk.

‡Methods of test for dairy industry : Part II Chemical analysis of milk.

(*Continued*)

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

APPARATUS/EQUIPMENT	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Rubber bungs, assorted sizes, tall-form, 6 to 60 mm diameter	+	+	+
Rubber stoppers, Gerber fat test, double-ended (*see* IS : 1223-1958*)	+	+	+
Sample boxes, metal/wooden	+	+	+
Sampling dippers, stainless steel, with long handles, 200 ml, 100 ml, 10 ml, 3 ml, 1 ml [*see* IS : 1479 (Part I)-1960†]	+	+	+
Scissors	+	+	+
Sediment tester for examining milk, with discs	+	+	+
Sieves, width of aperture 1-2 mm (*see* IS : 460-1962‡)	+	—	—
Siphon for drawing sulphuric acid from carboys	+	+	+
Slides, microscope, 2·5 × 7·5 cm/5·0 × 7·5 cm/5·0 × 11·25 cm, thickness 1·0 to 1·2 mm	+	+	—
Slide storage box	+	+	—
Spatulas, nickel, flat ends, length 12 cm	+	+	+
Stage micrometer slide, rules in 0·1 and 0·01 mm	+	+	—
Stand for Gerber butyrometers	+	+	+
Stand, test-tubes	+	+	+
Sterilized milk comparator disc (for colour matching)	+	—	—
Stirrer, electric, with speed controller	+	—	—
Stop watch, recording 30 minutes, with 60 seconds dial, divided into 0·2 seconds intervals; stop and reset by consecutive pressure on the winder, jewel movement	+	+	—

*Specification for apparatus for the determination of fat in whole milk, evaporated (unsweetened) milk, separated milk, skim milk, buttermilk and cream by the Gerber method.

†Methods of test for dairy industry : Part I Rapid examination of milk.

‡Specification for test sieves (*revised*).

(*Continued*)

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

Apparatus/Equipment	Category of Dairy Laboratory		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Stove, primus type	+	+	+
Syringes for transfer of 0·01 ml milk	+	+	−
Taps, water, capstain head, black bronze	+	+	+
Taps, water, swan-neck in the centre and two capstain head taps on side, black bronze	+	+	+
Test-tubes, rimless, heat-resistant glass, 250 × 25 mm	+	−	−
Test-tubes, with rim, heat-resistant glass:			
150 × 12 mm	+	+	+
150 × 18 mm	+	+	+
150 × 25 mm	+	+	−
Test-tubes 150 × 19 mm, with/without ring at 10 ml, with rubber stoppers	+	+	+
Test-tubes, 150 × 16 mm, with/without ring at 10 ml, with rubber stoppers	+	+	+
Thermometers, white enamelled back, graduated on stem in 1°C:			
0-110°C	+	+	+
0-200°C	+	+	+
0-250°C	+	+	−
0-350°C	+	+	+
Thermometers, white enamelled back, graduated on stem, with certificate, in 1°C:			
0-50°C	+	+	+
0-110°C	+	+	+
0-200°C	+	+	+
Tiles, white, glazed, porcelain, 12·5 cm²	+	+	+
Timepiece	+	+	+
Timer, for automatic timing for periods up to 60 minutes	+	+	−
Tongs, brass, nickel plated	+	+	+
Trays, plastic and aluminium	+	+	+

(*Continued*)

TABLE 4 APPARATUS AND EQUIPMENT REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

APPARATUS/EQUIPMENT	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Tripod stands, iron, height 20 cm	+	+	+
Wash bottles, 1 000 ml	+	+	+
Watch glasses:			
dia 150 mm	+	+	+
„ 120 mm	+	+	+
„ 100 mm	+	+	+
„ 75 mm	+	+	+
„ 62 mm	+	+	+
Water-bath, copper, rectangular, with five holes in the cover, fitted with concentric rings 30 × 20 cm, electric	+	+	−
Water-bath, copper, round, with concentric rings, diameter 20/30 cm, electric, with heat control switches	+	+	+
Water-bath, electric, thermostatically controlled to ± 0·5°C, free working space 35 × 26 × 22 cm, for methylene blue and resazurin tests, with cover, test-tube stands and thermometer	+	+	+
Water heater, electric, 2-kW, capacity 100 litres	+	+	−
Weighing bottles, glass, height 50 mm	+	+	+
Wet and dry bulb thermometers in°C	+	+	+
Weights 1 g to 3 kg, brass, nickel plated, with box	+	+	−
Weights, analytical, brass, chrome plated, 1 mg to 100 g	+	+	+
Weights, fractional, 1 mg to 500 mg	+	+	+
Wire baskets for sterilizing test-tubes	+	+	+
Wire gauze with asbestos centre, diameter of the centre 12·5 cm	+	+	+
Wire, platinum, dia 0·5 to 0·75 mm	+	+	−
Wire, stainless steel, dia 2·6 mm, length 350 mm	+	+	−

TABLE 5 CHEMICALS AND CONSUMABLE STORES REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES

(*Clause* 9.1)

Note — The sign (+) means that the chemical is required and the sign (–) means that the chemical is not required.

Particulars	Category of Dairy Laboratory		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Acetone	+	–	–
Acid, acetic, glacial	+	+	–
Acid, hydrochloric, fuming, sp gr 1·18	+	+	+
Acid, hydrochloric, sp gr 1·16	+	+	+
Acid, nitric, AR, sp gr 1·42	+	+	+
Acid, nitric, sp gr 1·42	+	+	+
Acid, oxalic, AR	+	+	+
Acid, sulphuric, sp gr 1·84	+	+	+
Acid, sulphuric, sp gr 1·84, AR	+	–	–
Acid, sulphuric, for milk testing, density 1·807 to 1·812 g/ml at 27°C (90-91 percent) (*see* IS : 1224-1958*).	+	+	+
Adhesive tape	+	+	+
Agar-agar (bacteriological grade), powder/shreds	+	+	–
Alcohol, absolute/rectified spirit (to be obtained on licence)	+	+	+
Alizarin	+	+	+
Aluminium potassium sulphate	+	–	–
Ammonia, liquor, sp gr 0·88	+	+	+
Ammonium molybdate	+	+	–
Ammonium ferric sulphate	+	+	+
Ammonium sulphate, AR	+	+	+

*Determination of fat in whole milk, evaporated (unsweetened) milk, separated milk, skim milk, buttermilk, and cream by the Gerber method.

(*Continued*)

TABLE 5 CHEMICALS AND CONSUMABLE STORES REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

Particulars	Category of Dairy Laboratory		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Ammonium sulphide	+	+	+
Ammonium thiocyanate	+	+	—
Amyl alcohol for milk testing, density 0·810-0·812 g/ml at 20°C (*see* IS : 1224-1958*)	+	+	+
Amyl alcohol, normal, sp gr 0·817	+	—	—
Antimony trichloride, AR	+	—	—
Asbestos for gooch	+	+	—
Barium chloride	+	+	—
Bark corks, tall-form, bottom diameter 6 mm to 50 mm	+	+	+
Beef extract	+	+	—
Benzidine	+	+	—
Benzoic acid	+	+	+
Bile salts	+	+	+
Bleaching powder (35 percent available chlorine)	+	+	+
Borax	+	+	+
Boric acid	+	+	+
Brilliant green (bacteriological quality)	+	+	—
Bromophenol blue solution for *p*H determination	+	+	+
Bromothymol blue solution for *p*H determination	+	+	+
Brown paper	+	+	+
Brushes for bottles	+	+	+
Brushes for flasks	+	+	+
Brushes for test-tubes	+	+	+
Buffer substrate tablets for phosphatase test	+	+	—

*Determination of fat in whole milk, evaporated (unsweetened) milk, separated milk, skim milk, buttermilk, and cream by the Gerber method.

(*Continued*)

TABLE 5 CHEMICALS AND CONSUMABLE STORES REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

PARTICULARS	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Butter paper	+	+	+
Calcium carbonate	+	+	−
Calcium chloride, crystalline (6 H_2O)	+	+	−
Calcium chloride, granules, anhydrous	+	+	+
Calcium hydroxide	+	+	−
Carbolic acid	+	+	−
Carbon disulphide	+	+	−
Cedarwood oil	+	+	−
Chloroform	+	+	−
Chloroform, AR	+	−	−
Citric acid	+	+	−
Cobalt nitrate	+	+	−
Copper filings	+	+	−
Copper sulphate	+	+	−
Copper sulphate, AR	+	+	−
Copper wire, dia 0·75 mm	+	+	−
Cotton discs for milk sediment test	+	+	+
Cotton wool, absorbent, white, sterilized	+	+	+
Crystal violet (bacteriological quality)	+	+	−
Denatured spirit	+	+	+
Dimethylglyoxime	+	−	−
1, 8-dihydroxynephthalene disulphonic acid	+	+	−
Dioctyl sodium sulphosuccinate	+	+	−

(Continued)

TABLE 5 CHEMICALS AND CONSUMABLE STORES REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

PARTICULARS	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Diphenylamine sulphate	+	+	+
Diphenylbenzidine	+	+	+
Dipotassium hydrogen phosphate, AR	+	+	—
Disodium hydrogen phosphate	+	—	—
Disodium *p*-nitrophenyl-phosphate, AR	+	+	+
Dusters, 60 × 60 cm	+	+	+
Eosin Y (bacteriological grade)	+	+	—
Ether diethyl (peroxide free)	+	+	—
Ferric ammonium citrate	+	+	—
Ferric chloride	+	+	+
Ferric sulphate	+	+	+
Filter paper, Whatman No. 1 equivalent quality, assorted sizes/sheets 60 × 45 cm	+	+	+
Filter paper, Whatman No. 4 equivalent quality, 9-cm circles	+	+	—
Filter paper, Whatman No. 12 equivalent quality, 12·5-cm circles	+	+	—
Filter paper, Whatman No. 40 equivalent quality, 12·5-cm circles	+	—	—
Formaldehyde, 40 percent solution, AR	+	+	+
Glass marking pencils, assorted colours	+	+	+
Glass wool	+	+	+
Glucose	+	+	+
Glycerine	+	+	—
Grease for glass stop-cocks	+	+	+
Hydrogen peroxide (130 volumes)	+	+	—

(*Continued*)

TABLE 5 CHEMICALS AND CONSUMABLE STORES REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

PARTICULARS	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Immersion oil, refractive index 1·51-1·52 at 20°C	+	+	–
Iodine crystals	+	+	+
Iron (ferric) alum	+	+	–
Labels, preferably gummed back	+	+	+
Lactic acid	+	+	–
Lactose, AR	+	+	+
Lime water	+	+	+
Litmus paper strips, blue	+	+	+
Litmus paper strips, red	+	+	+
Mannitol	+	+	–
Match boxes	+	+	+
Mercuric chloride	+	+	+
Mercuric iodide	+	+	–
Mercury	+	+	+
Methylene blue chloride	+	+	–
Methylene blue (bacteriological grade), powder/tablets for testing milk	+	+	+
Methyl orange	+	+	–
Methyl red	+	+	–
Neutral red (bacteriological grade)	+	+	+
Nickel chloride	+	–	–
Nitrobenzene	+	+	+
Ox bile	+	+	+

(*Continued*)

TABLE 5 CHEMICALS AND CONSUMABLE STORES REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

PARTICULARS	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Paraffin wax	+	+	+
Paraphenylenediamine hydrochloride	+	+	+
Peptone (bacteriological grade)	+	+	+
Petroleum ether (bp below 60°C)	+	+	—
Phenolphthalein	—	+	+
Phenylhydrazine hydrochloride	+	+	+
Phosphotungstic acid	+	+	+
Picric acid	+	+	+
Potassium alum	+	+	—
Potassium chloride, AR	+	+	—
Potassium chromate	+	+	—
Potassium dichromate	+	+	+
Potassium dichromate, AR	+	+	+
Potassium dihydrogen phosphate, AR	+	+	—
Potassium ferricyanide, AR	+	+	—
Potassium ferrocyanide, AR	+	+	—
Potassium hydrogen phthalate, AR	+	+	—
Potassium hydroxide	+	+	—
Potassium iodide	+	+	—
Potassium nitrate	+	+	—
Potassium nitrite	+	+	—
Potassium oxalate	+	+	—
Potassium permanganate, AR	+	+	—

(*Continued*)

TABLE 5 CHEMICALS AND CONSUMABLE STORES REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

PARTICULARS	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Potassium sodium tartrate (Rochelle salt)	+	+	–
Potassium sulphate, anhydrous	+	+	–
Potassium thiocyanate, AR	+	+	–
Quinhydrone, AR	+	+	–
Resazurin (bacteriological grade) powder/tablets for milk testing	+	+	+
Resorcinol	+	+	–
Rosalic acid	+	+	+
Rosaniline acetate	+	+	+
Rubber tubing, ordinary, assorted sizes, inner diameter 7 to 25 mm	+	+	+
Rubber tubing, pressure, assorted sizes, diameter of the bore 3 to 7 mm	+	+	+
Salicylic acid	+	+	+
Sand, fine sifted	+	+	–
Sand paper, fine grade	+	+	–
Silver nitrate	+	+	–
Soap	+	+	+
Soda ash (washing soda)	+	+	+
Sodium acetate	+	+	–
Sodium bicarbonate	+	+	+
Sodium carbonate	+	+	–
Sodium carbonate, AR	+	+	+
Sodium chloride	+	+	+

(*Continued*

TABLE 5 CHEMICALS AND CONSUMABLE STORES REQUIRED IN DIFFERENT CATEGORIES OF DAIRY LABORATORIES — *Contd*

PARTICULARS	CATEGORY OF DAIRY LABORATORY		
	A, B, C	D	E
(1)	(2)	(3)	(4)
Sodium chloride, AR	+	+	—
Sodium citrate	+	+	—
Sodium desoxycolate	+	+	—
Sodium formate	+	+	+
Sodium hydroxide, sticks/pallets	+	+	+
Sodium hydroxide, sticks/pallets, AR	+	+	—
Sodium nitrate	+	+	—
Sodium recinolate	+	+	+
Sodium sulphate, anhydrous, AR	+	+	—
Sodium taurocholate	+	+	+
Sodium thiosulphate, AR	+	+	—
Stannous chloride	+	+	—
Starch, soluble, AR	+	+	—
Strontium hydroxide	+	+	—
Sucrose, AR	+	+	+
Tetrachloroethane	+	+	—
Toluene	+	+	—
Trichloracetic acid	+	+	—
Tryptone (bacteriological grade)	+	+	—
Turmeric paper	+	+	+
Universal indicator	+	+	—
Urea	+	—	—
Vaseline	+	+	+
Xylene	+	+	—
Yeast extract	+	+	+
Yeastrel	+	+	—
Zinc acetate	+	+	—

(*Continued from page* 2)

Members	*Representing*
GOVERNMENT ANALYST	Government of Madras
SHRI V. KURIEN	Kaira District Co-operative Milk Producers' Union Ltd., Anand
SHRI H. M. DALAYA (*Alternate*)	
SHRI A. K. MAJUMDAR	Dairy Development Commissioner, Government of Maharashtra
SHRI N. D. KOTNIS (*Alternate*)	
SHRI R. K. MALIK	Directorate of Marketing & Inspection (Ministry of Food & Agriculture), Nagpur
MILK COMMISSIONER	Milk Commissioner, Madras
SHRI S. N. MITRA	Central Food Laboratory, Calcutta
DR. S. S. PHATAK	Technical Standardization Committee (Foodstuffs) (Ministry of Food & Agriculture)
PUBLIC ANALYST	Government of West Bengal
SHRI RAM SARUP	Indian Council of Agricultural Research, New Delhi
DR. ARUN KUMAR SENGUPTA	Milk Commissioner, West Bengal
DR. M. SWAMINATHAN	Central Food Technological Research Institute (CSIR), Mysore
SHRI JAMES N. WARNER	In personal capacity (*Allahabad Agricultural Institute, Allahabad*)

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones : 331 01 31, 331 13 75 Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :	*Telephone*
*Western : Manakalaya, E9 MIDC, Marol, Andheri (East), BOMBAY 400093	6 32 92 95
†Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola, CALCUTTA 700054	36 24 99
Southern : C. I. T. Campus, MADRAS 600113	41 24 42
Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036	2 18 43 3 16 41
Branch Offices :	
'Pushpak' Nurmohamed Shaikh Marg, Khanpur, AHMADABAD 380001	2 63 48 2 63 49
'F' Block Unity Bldg, Narasimharaja Square, BANGALORE 560002	22 48 05
Gangotri Complex, Bhadbhada Road, T. T. Nagar, BHOPAL 462003	6 67 16
Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002	5 36 27
53 5, Ward No. 29, R. G. Barua Road 5th Byelane, GUWAHATI 781003	—
5-8-56C L. N. Gupta Marg, HYDERABAD 500001	23 10 83
R14 Yudhister Marg, C Scheme, JAIPUR 302005	6 98 32
117/418 B Sarvodaya Nagar, KANPUR 208005	21 68 76
Patliputra Industrial Estate, PATNA 800013	6 23 05
Hantex Bldg (2nd Floor), Rly Station Road, TRIVANDRUM 695001	7 66 37
Inspection Office (With Sale Point) :	
Pushpanjali 205-A West High Court Road Bharampeth Extension, NAGPUR 440010	2 51 71
Institution of Engineers (India) Building, 1332 Shivaji Nagar, PUNE 411005	5 24 35

---

*Sales Office in Bombay is at Novelty Chambers, Grant Road, Bombay 400007 89 65 28

†Sales Office in Calcutta is at 5 Chowringhee Approach, P O Princep Street, Calcutta 700072 27 68 00

Printed at Simco Printing Press, Delhi, India